

# RESERVE COPY PATENT SPECIFICATION



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494.093

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## PROVISIONAL SPECIFICATION

### Method and Apparatus for Controlling Ships and like Vessels

I, IVAN ALEXANDER GAVRILOF, a citizen of the Argentine Republic, of Avenida Alvear 4456, Departamento 7, Buenos Aires, Argentine, do hereby declare the nature of this invention to be as follows:—

This invention for a method and apparatus for controlling ships and like vessels has as one object the provision of means for stabilising and steering a ship and with this and other objects in view consists in the provision of one or more fin-like members projecting from the vessel disposed in a direction generally parallel to the longitudinal axis thereof and means for creating a difference in pressure between the two faces of the fin. By regulating the directions and value of the force represented by the pressure difference, the motion of the ship can be controlled.

The fin-like members are substantially longer than they are broad and desirably are tapered at their ends or may be stream-lined and may be fixed permanently in position or may be retractible within the body of the vessels. A number of cylinders or cylindrical bodies rotatable about their axes are disposed with their axes transversely to the hull in apertures in the fins, which cylinders are of greater diameter than the thickness of the fin. The axes of the cylinders in any one fin are substantially parallel and preferably lie in the same plane as the plane passing through the centre of the thickness of the fin. The cylinders are rotated by any suitable means within the hull of the ship such as electric motors individual to each cylinder or a motor common to all the cylinders of one or more fins. If desired, the cylinders may be provided at their ends with discs so that they present a bobbin-like appearance.

In operation, when for example the ship moves forward and when the cylinders are driven in one or other direction, then on one face or side of the fin the water will tend to "pile up" whilst on the other the water will tend to slip past the fin due to the action of that part of the cylinders with which it comes in con-

tact, consequently there will be a reduction of pressure on one side of the fin and an increased pressure on the other, whereby a difference in pressure between the two sides of the fin will be created causing it to tend to move in the direction of the greater pressure. In other words the device of the present invention will create a force transverse to the longitudinal axis of the vessel.

Fins according to the present invention may be rigidly secured to a submerged part of the ship and, depending upon their position may have different functions. For example by disposing fins on each side of the hull, preferably at the centre part of the ship, the differential forces on the fins may be used for preventing or minimising rolling.

In another example the fins may be placed horizontally in the fore and aft parts of the ship for preventing or minimising pitching whilst yawing may be compensated by disposing fins vertically in the bow or stern part of the ship.

By disposing a fin vertically in the bow or stern of the ship, it may be used for steering purposes and may be used alone or in conjunction with a rudder as usually fitted.

The invention is also applicable to submarines and may be used for steering them or for maintaining a desired submersion either alone or in addition to the horizontal rudders customarily used at present.

Where two or more fins are used the speed and direction of rotation of the cylinders may be controlled either manually or by means of a gyroscopic system. For example if there is a fin provided on each side of the ship arranged to minimise or prevent rolling, the speed and direction of rotation may be controlled by means of a gyroscopic system or manually as aforesaid in a manner such that upon the ship tending to roll in one direction the cylinders on one side of the ship are caused by the gyroscope to rotate in one direction whilst the cylinders on the other side are caused to rotate in the opposite direction thus maintaining the ship on an even keel.

[Pri

Dated this 16th day of April, 1937.

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40, Chancery Lane, London, W.C.2,  
Agents.

## COMPLETE SPECIFICATION

### Method and Apparatus for Controlling Ships and like Vessels

I, IVAN ALEXANDER GAVRILOF, a citizen of the Argentine Republic, of Avenida Alvear 4456, Departamento 7, Buenos Aires, Argentine, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to the controlling of ships and like vessels and has for its object the provision of means for controlling the rolling, pitching and yawing movements and/or for the steering of a ship and with this object in view consists in the provision of one or more stationary fin-like members projecting from the vessel disposed in a direction generally parallel to the longitudinal axis thereof and means for creating a difference in pressure between the two faces of the fin. By regulating the directions and value of the force represented by the pressure difference, the motion of the ship can be controlled.

I am aware that it has been suggested to apply the Magnus effect to stabilising fins.

According to the invention the means for creating a difference in pressure comprises a number of cylindrical bodies having a diameter greater than the thickness of the fin which bodies are disposed with their axes transversely of the longitudinal axis of the hull of the ship in apertures in the fins and mounted for rotation about their axes. The fins which are stationary and are of substantially constant thickness throughout their length except at their ends, are disposed below the surface of the water and when the cylinders are rotated in either direction the water will tend to "pile up" on one face of the fin whilst on the other the water will tend to slip past the fin due to the action of that part of the cylinder with which it comes in contact, consequently there will be a reduction of pressure on one side of the fin and an increased pressure on the other thus creating a force transverse to the longitudinal axis of the vessel. By suitably disposing the fins at various parts of the ship, rolling, pitching, and yawing may be minimised or prevented. The vessel may also be steered by the fins of the present invention by disposing

them in the bow and/or stern thereof.

In the accompanying drawings various applications of the present invention are illustrated. Fig. 1 is a plan view of a fin constructed according to the present invention; Fig. 2 is an end view while Fig. 3 is a side view on line III—III of Fig. 1. Figs 4 to 12 diagrammatically illustrate hulls of vessels incorporating the fins of the present invention disposed at suitable points depending upon the function desired. Figs. 13 and 14 are respectively sectional side and end views on XIV—XIV of the interior of a cylindrical body embodying a particular construction.

Referring to the drawings, each fin-like member 1 is substantially longer than it is broad and is tapered at its ends as indicated in Fig. 3 or it may be streamlined. A number of cylinders or cylindrical bodies 2 each having a diameter greater than the thickness of the fin 1 is disposed in suitable apertures 4 in the fin 1 and mounted for rotation on shafts 3 passing through their axes which in any one fin are substantially parallel and preferably lie in the same plane as the plane passing through the centre of the thickness of the fin. If desired, the cylinder may be provided with discs 5 at their ends so that they present a bobbin-like appearance. These discs may be detachable so that they can be replaced if damaged or entirely removed if not desired.

The fins with their cylinders are mounted at suitable points on the hull of the vessel and may be permanently secured in position or may be arranged to be retracted within the vessel through ports therein when their use is not required. Various suitable positions for the fins are illustrated in Figs. 4 to 12. In Figs. 4 and 5 the fins are arranged to minimise or prevent rolling; in Figs. 6 to 8 the fins are arranged to minimise or prevent pitching; in Figs. 9 and 10 the fins are arranged to prevent or minimise yawing whilst in Figs. 11 and 12 a fin constructed according to the present invention is utilised to steer the vessel which may be used alone or in conjunction with the rudder usually fitted.

The cylinders are rotated about their axes by any suitable means such for

example as electric motors within the vessel either common to all the cylinders of one or more fins or individual to each cylinder. Alternatively each cylinder 5 may be driven by an electric motor placed within it as illustrated in Figs. 13 and 14. The motor in the example is a three phase induction motor having its stator 7 rigidly mounted on shaft 3 co-axial 10 with the axis of the cylinder. The shaft 3 may be bored to form conduits for the circulation of cooling fluid as indicated by the arrows at the top of Fig. 13. The rotor 8 of the motor is mounted on ball 15 bearings 9 in any convenient manner and is surrounded by the outer shell of the cylinder 2. Suitable packing 10 is provided at each end of the cylinder to prevent the entry of water into the interior 20 of the shell. The cylinder in these two figures is mounted in a frame-work formed by a girder 12 extending along the outer length of the fin connected to a flange 13 extending along the inner 25 length of the fin by angle irons 11, metal sheeting or plates of suitable shape being supported by adjacent frames to form the fin. Preferably, adjacent the cylinders 2, the fins are shaped as shown at 14 in Fig. 14.

In operation, when for example the ship moves forward and when the cylinders are driven in one or other direction, then on one face or side of the fin the 35 water will tend to "pile up" whilst on the other the water will tend to slip past the fin due to the action of that part of the cylinders with which it comes in contact, consequently there will be a 40 reduction of pressure on one side of the fin and an increased pressure on the other, whereby a difference in pressure between the two sides of the fin will be created ensuing it to tend to move in the 45 direction of the greater pressure. In other words the device of the present invention will create a force transverse to the longitudinal axis of the vessel.

The invention is also applicable to 50 submarines and may be used for steering them.

Where two or more fins are used the speed and direction of rotation of the cylinders may be controlled either 55 manually or by means of a gyroscopic system. For example if there is a fin provided on each side of the ship arranged to minimize or prevent rolling, the speed and direction of rotation may be controlled by means of a gyroscopic system 60 or manually as aforesaid in a manner such that upon the ship tending to roll in one direction the cylinders on one side of the ship are caused by the gyroscope 65 to rotate in one direction whilst the

cylinders on the other side are caused to rotate in the opposite direction thus maintaining the ship on an even keel.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. An apparatus for controlling the rolling, pitching and yawing and/or for 75 the steering of ships and like vessels, comprising one or more stationary fin-like members, which have constant thickness throughout their length except at their ends, projecting from the vessel and 80 disposed in a direction generally parallel to the longitudinal axis thereof, and cylindrical bodies having a diameter greater than the thickness of the fin and 85 disposed with their axes transversely of the hull in apertures in the fin said bodies adapted to be driven to rotate about their axes in either direction whereby they may create a difference in pressure 90 between the two faces of the fin.

2. Apparatus according to claim 1 in which the bodies are driven by motors disposed either within the vessel or within each of the bodies.

3. Apparatus according to claim 1 in 95 which a number of cylindrical bodies are disposed in one fin and are all adapted to be driven by an electrical motor or other suitable power means common to them all. 100

4. Apparatus according to any one of claims 1 to 3 in which the cylindrical bodies are provided with discs at their ends so that they present a bobbin-like 105 appearance.

5. Apparatus according to claim 4 in which the said discs are removable.

6. A ship or like vessel having a stationary fin-like member as defined in claim 1 projecting from its bow and/or 110 stern, a number of cylindrical bodies having a diameter greater than the thickness of the fin, mounted for rotation about an axis lying in a plane within the thickness of the fin and means for driving 115 the cylinders in either direction.

7. A ship or like vessel having stationary fin-like members as defined in claim 1 projecting from its sides, a number of cylindrical bodies having a 120 diameter greater than the thickness of the fin, mounted for rotation about an axis lying in a plane within the thickness of the fin, means for driving the cylinders in either direction and means 125 for controlling the speed and direction of rotation of the cylinders.

8. A ship or like vessel according to claim 7 in which the controlling means 130 comprises a gyroscope system.

9. Apparatus for controlling the motion of ships and like vessels substantially as hereinbefore described with reference to Figs. 1 to 3 of the drawings.

Dated this 1st day of March, 1938.  
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[This Drawing is a reproduction of the Original on a reduced scale.]

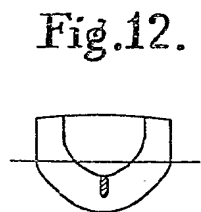
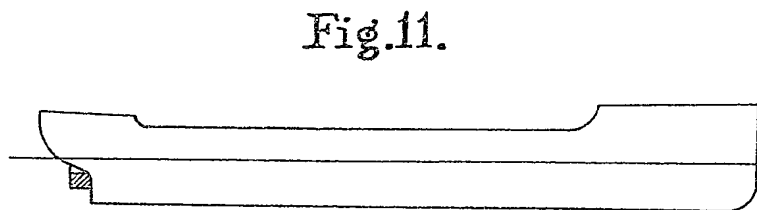
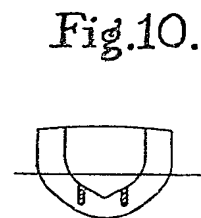
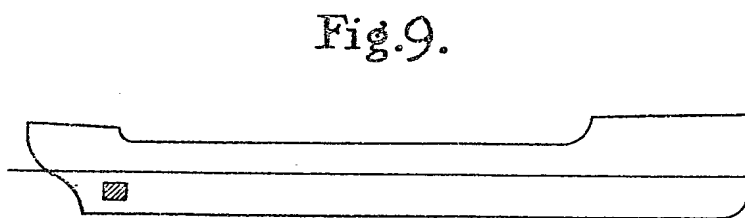
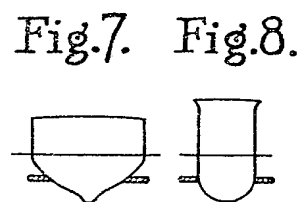
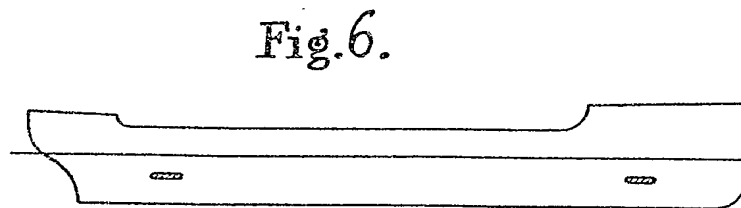
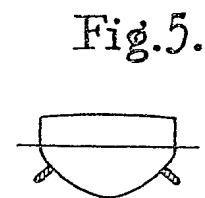
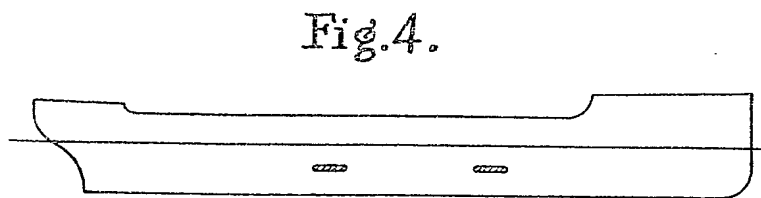
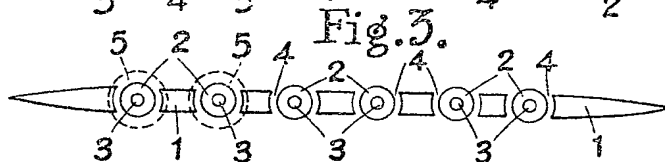
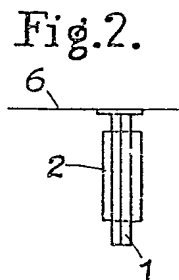
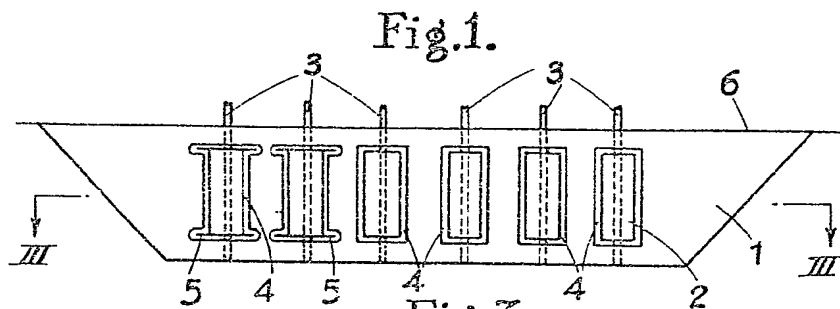


Fig.2.

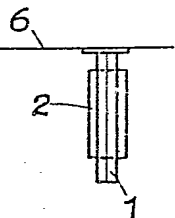


Fig.5.



Fig.7. Fig.8.

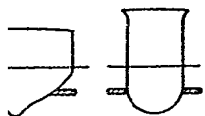


Fig.10.

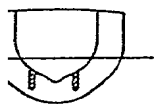


Fig.12.

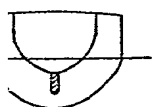


Fig.13.

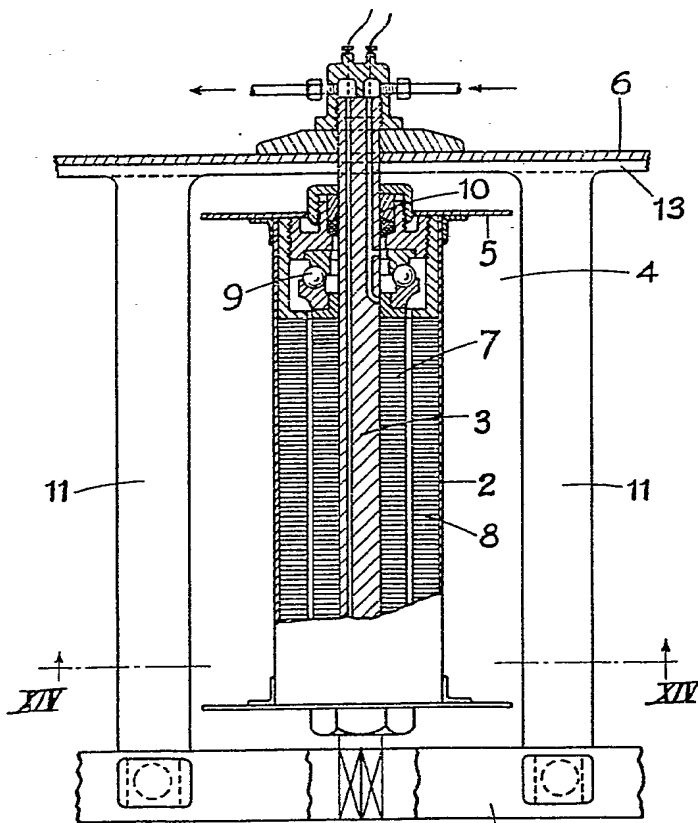
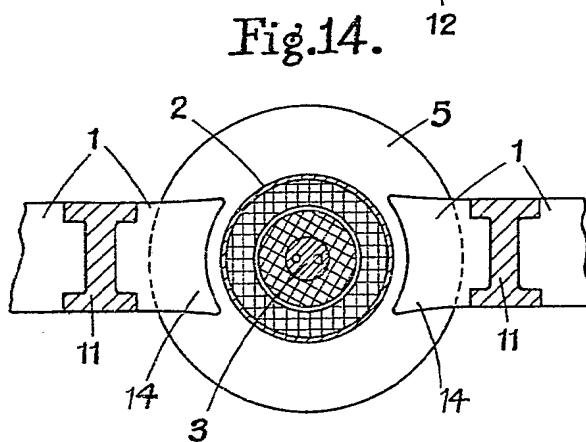


Fig.14.



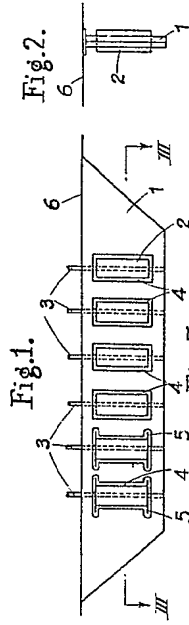


Fig. 4.



Fig. 6.



Fig. 8.

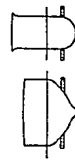


Fig. 9.

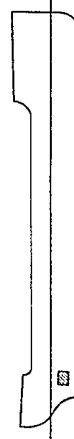


Fig. 10.



Fig. 11.



Fig. 12.



Fig. 13.

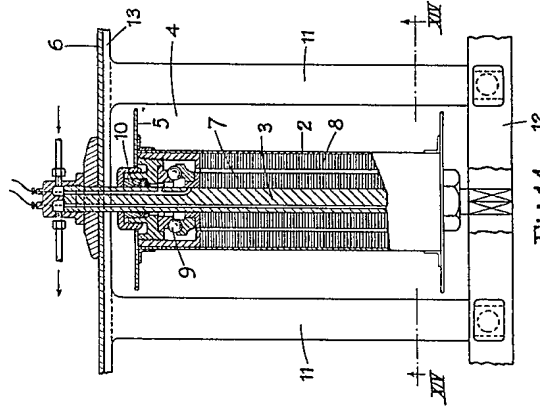
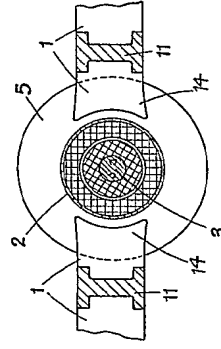


Fig. 14.



[This Drawing is a reproduction of the Original on a reduced scale.]